

*Observations and Experiments on the Daily Variation of the Horizontal and Dipping Needles under a reduced Directive Power.* By Peter Barlow, Esq. F.R.S. of the Royal Military Academy. Communicated by Davies Gilbert, Esq. V.P.R.S. Read June 12, 1823. [*Phil. Trans.* 1823, p. 326.]

By disposing magnets so as partly to counteract the influence of the earth's polarity on a magnetic needle, the author suspected that its daily variation might possibly exhibit itself in a very increased degree; and in experimentally prosecuting the idea, he found it to be the case to a very considerable extent in regard to the horizontal needle; and to take place also, though less satisfactorily, with the dipping-needle.

In the former experiment a finely suspended horizontal needle was used, the directive power of which was reduced by two magnets, properly placed for the purpose; a deviation of  $3^{\circ} 15'$  was thus obtained at 11 A.M., which decreased to a late hour in the evening. The needle was kept in the same position for three days, with some change of directive power, with similar general results. After adverting to a difference in the direction of the variation in and out of doors, Mr. Barlow details the results of several experiments, which lead him to the following conclusions:—that while the north end of the needle is directed to any point from the S. to N.N.W., its motion during the forenoon advances towards the N.; and while directed towards any point between the N. and S.S.E. its motion is still to some point between the N. and N.N.W., so that there ought to be some direction between those limits in which the daily motion is a minimum: but whether this is a fixed direction during the year, or whether it has any vibratory motion as the sun changes its declination, is a question requiring further experiments to determine. Another conclusion which the author draws is, that the daily change is not produced by a general deflection of the directive power of the earth, but by an increase and decrease of attraction of some point between the N. and N.N.E., or between the S. and S.S.E.

The variation of the adjusted dipping-needle did not indicate the gradually increasing and decreasing power manifested by the horizontal needle; and although it evidently is subject to diurnal change, the law of that change remains to be determined.

*On the Diurnal Deviations of the Horizontal Needle when under the influence of Magnets.* By Samuel Hunter Christie, Esq. M.A. Fellow of the Cambridge Philosophical Society: of the Royal Military Academy. Communicated by Sir Humphry Davy, Bart. P.R.S. Read June 19, 1823. [*Phil. Trans.* 1823, p. 342.]

This paper contains a detailed account of a series of observations on the diurnal magnetic variation made upon the principle pointed out by Mr. Barlow, in his communication already before the Society. In regard, however, to the arrangement adopted by the author, it

differed from that of Mr. Barlow, for instead of applying a magnet in the horizontal plane of the needle he placed two in the line of the dip, having their poles in the reverse position to those of the needle. In describing the results of his experiment, Mr. Christie calls the south pole of a magnet that which points to the north pole of the earth, so that the north end is the south pole, and the south end the north pole of his magnetic needles. In stating the deviations from any point considered as zero, those which he places in the direction of the sun's apparent daily motion are considered minus, and those in a contrary direction plus, whatever may be the position of the needle. The results of Mr. Christie's observations are given in the form of tables, the first of which extend from March 26 to March 31, and exhibit manifest deviation towards the east before eight in the morning, and the greatest westerly deviation about one p.m. In a second series of observations, with another needle, the directive force of which was to the power as 1.63 to 1, the times of the greatest easterly and westerly deviation agreed with the former, but the easterly was greater compared with the westerly. In a third series the suspension of the needle was improved, and the magnets were so adjusted as to render its directive force as 0.68 to 1. With this needle the observations were made nearly every hour, from the 5th to the 12th of April, and the mean results give the greatest easterly variation at 7<sup>h</sup> 45<sup>m</sup>, the time of no deviation at 9<sup>h</sup> 26<sup>m</sup>; the greatest westerly deviation took place at 1<sup>h</sup> 24<sup>m</sup>, the time of zero being 6<sup>h</sup> 40<sup>m</sup>, and the total daily variation amounting to 3° 41'. After adverting to the influence of the weather, to irregularities referrible to the electric state of clouds, and to other causes of anomalies in prosecuting his inquiries, the author proceeds to determine the results of a numerous series of observations made as the former, but in which the position of the needle was somewhat altered, as well as that of the bar magnets; and to examine into the daily changes which take place at the points at which a needle is retained in equilibrio by two bar magnets, which he is led to believe arise from an actual change of intensity in the terrestrial forces, as well as from a change in their directions.

The author concludes his paper with remarks upon the influence of temperature in diminishing the power of the magnets, and infers that solar heat exceeds any other in producing such an effect; but that changes of temperature are not the only cause of the variations which take place in the points of equilibrium, is shown by their occurring independent of the temperature of the magnets.

*On Fossil Shells.* By Lewis Weston Dillwyn, Esq. F.R.S. In a Letter addressed to Sir Humphry Davy, Bart. P.R.S. Read June 5, 1823. [*Phil. Trans.* 1823, p. 393.]

In describing the shell fish supposed to yield the Tyrian dye, Pliny has adverted to its power of boring the shells of other fish; and Lamarck says that all mollusca, whose shells have a notch at the base of their